

Listing of Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (currently amended) A process for forming a barrier film to prevent poisoning a photoresist material used in forming a semiconductor device, comprising:
depositing a first barrier layer containing silicon carbide and nitrogen directly on a layer having an interconnect surface located to control electrical leakage from a conductor;

depositing a nitrogen-free second barrier layer directly on top of the first barrier layer;

forming a first low-k dielectric layer over the second barrier layer; and

depositing a photoresist material to form a photoresist layer above at least a portion of the first low-k dielectric layer.

2. (original) The process of claim 1, further comprising patterning, and etching the photoresist layer to form a photoresist mask.

3. (original) The process of claim 1, wherein depositing a nitrogen-free second barrier layer on top of the first barrier layer comprises depositing a nitrogen-free silicon carbide layer.

4. (original) The process of claim 3, wherein the process tool used to deposit the first barrier layer is used to deposit the nitrogen-free second barrier layer.

5. (original) The process of claim 1, wherein depositing a first barrier layer containing silicon carbide and nitrogen comprises using a PECVD process and one of NH_3 , N_2 , and N_2O as a chemical precursor to supply the nitrogen.

6. (original) The process of claim 5, wherein depositing a nitrogen-free second barrier layer comprises using the PECVD process recited in claim 5 and turning off the supply of nitrogen.

7. (currently amended) ~~The process of claim 3, further comprising:~~

A process for forming a barrier film to prevent poisoning a photoresist material used in forming a semiconductor device, comprising:

depositing a first barrier layer containing silicon carbide and nitrogen on a surface located to control electrical leakage from a conductor;

depositing a nitrogen-free second barrier layer directly on top of the first barrier layer, wherein the nitrogen free second barrier layer is a silicon carbide layer;

forming a first low-k dielectric layer over the second barrier layer;
forming an etch stop layer on top of the second barrier layer and forming a
second low-k dielectric layer on top of the etch stop layer;
after forming the second low-k dielectric layer, depositing a photoresist
material to form a photoresist layer above at least a portion of the first low-k dielectric
layer;
~~prior to depositing said photoresist material, forming an etch stop layer on top~~
~~of the second barrier layer and forming a second low-k dielectric layer on top of the~~
~~etch stop layer;~~
 patterning the photoresist layer to form a photoresist mask over the second
low-k dielectric layer where a via is to be formed;
 forming the via by etching through the second low-k dielectric layer, the etch
stop layer, and the first low-k dielectric layer using the photoresist mask;
 removing the photoresist mask;
 forming and patterning a second photoresist layer to form a second photoresist
mask over the second low-k dielectric layer where a trench is to be formed; and
 forming a trench in the second low-k dielectric layer by etching using the
second photoresist mask to complete a dual damascene structure.

8. (previously amended) The process of claim 7, wherein the nitrogen-free
silicon carbide barrier layer is formed by injecting an $\text{SiH}_x(\text{CH}_3)_y$ gas, where x is
chosen in the range of 0 to 3, and $x+y = 4$.

9. (original) The process of claim 3, further comprising:
 prior to depositing said photoresist material, forming an etch stop layer on top
of the second barrier layer and forming a second low-k dielectric layer on top of the
etch stop layer;
 patterning the photoresist layer to form a photoresist mask over the second
low-k dielectric layer where a trench is to be formed;
 forming the trench in the second low-k dielectric layer by etching using the
photoresist mask;
 forming and patterning a second photoresist layer to form a second
photoresist mask over the second dielectric layer and the trench; and
 forming a via in the first dielectric layer by etching to complete a dual
damascene structure.

10. (previously amended) The process of claim 9, wherein the nitrogen-free silicon carbide barrier layer is formed by injecting an $\text{SiH}_x(\text{CH}_3)_y$ gas, where x is chosen in the range of 0 to 3, and $x+y = 4$.

11. (original) The process of claim 9, wherein depositing a first barrier layer containing silicon carbide and nitrogen comprises using a PECVD process and one of NH_3 , N_2 , and N_2O as a chemical precursor to supply the nitrogen.

12. (original) The process of claim 3, further comprising:
prior to depositing said photoresist material, forming an etch stop layer on top of the second barrier layer

 patterning the photoresist layer to form a photoresist mask over the etch stop layer where a via is to be formed;

 forming a via mask by etching through the etch stop layer;

 removing the photoresist mask;

 depositing a second low-k dielectric layer on top of the via mask;

 forming and patterning a second photoresist layer to form a second photoresist mask over the second low-k dielectric layer where a trench is to be formed; and

 forming a trench and via by etching through the second and first low-k dielectric layers in one process step to complete a dual damascene structure.

13. (original) The process of claim 12, wherein depositing a first barrier layer containing silicon carbide and nitrogen comprises using a PECVD process and one of NH_3 , N_2 , and N_2O as a chemical precursor to supply the nitrogen.

14. (previously amended) The process of claim 12, wherein the nitrogen-free silicon carbide barrier layer is formed by injecting an $\text{SiH}_x(\text{CH}_3)_y$ gas, where x is chosen in the range of 0 to 3, and $x+y = 4$.

15 –20 Cancelled.

21. (previously added) The process of claim 1, wherein the thickness of the second barrier layer is approximately 25 % of the thickness of the first barrier layer.

22. (previously added) The process of claim 1, wherein the nitrogen free second barrier layer is formed immediately after the first barrier layer by using the same chemical precursors used in forming the first barrier layer except for the chemical precursors used to supply the nitrogen for the first barrier layer.

23. (currently amended) A process for forming a dual layer barrier film to prevent diffusion of nitrogen into a photoresist layer used in patterning a semiconductor device, comprising:

depositing a first barrier layer containing silicon carbide and nitrogen directly on an interconnect conductor;

depositing a nitrogen-free second barrier layer directly on the first barrier layer;

forming a first dielectric layer over the second barrier layer; and
depositing the photoresist layer over the dielectric layer.

24. (previously added) The process of claim 23, wherein the nitrogen-free second barrier layer comprises a nitrogen-free silicon carbide layer.